PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference PM 98.046	FOR FURTHER ACTION	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
International application No. PCT/US00/17101	International filing date *(day/month/year)* 21 JUNE 2000	(Earliest) Priority Date *(day/month/year)* 24 JUNE 1999
Applicant EXXONMOBIL UPSTREAM RESEARCH COMPANY		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 4 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**
   a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
   [ ] the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).
   b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing:
   [ ] contained in the international application in written form.
   [ ] filed together with the international application in computer readable form.
   [ ] furnished subsequently to this Authority in written form.
   [ ] furnished subsequently to this Authority in computer readable form.
   [ ] the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
   [ ] the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.
2. [ ] **Certain claims were found unsearchable** (See Box I).
3. [ ] **Unity of invention is lacking** (See Box II).
4. With regard to the **title**,
   [X] the text is approved as submitted by the applicant.
   [ ] the text has been established by this Authority to read as follows:
5. With regard to the **abstract**,
   [ ] the text is approved as submitted by the applicant.
   [X] the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.
6. The figure of the drawings to be published with the abstract is Figure No. 3
   [ ] as suggested by the applicant.
   [ ] because the applicant failed to suggest a figure.
   [X] because this figure better characterizes the invention.
   [ ] None of the figures.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/17101

Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

A method is provided for scaling up permeabilities associated with a fine-scale grid of cells representative of a porous medium (Fig. 1) to permeabilities associated with an unstructured coarse-scale grid of cells representative of the porous medium (Fig. 3). An areally unstructured, Voronoi, computational grid is generated using the coarse-scale grid as the genesis of the computational grid. The computational grid is then populated with permeabilities associated with the fine-scale grid. Flow equations are developed for the computational grid, the flow equations are solved, and inter-node fluxes and pressure gradients are then computed for the computational grid. These inter-node fluxes and pressure gradients are used to calculate inter-node average fluxes and average preesure gradients associated with the coarse-scale grid. The inter-node average fluxes and average pressure gradients associated with the coarse grid are then used to calculate upscaled permeabilities associated with the coarse-scale grid.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/17101

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :G06F 17/11; G01N 15/08; G01V 1/00
US CL :703/10, 2; 702/12; 367/73
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 703/2, 9, 10; 702/6, 11, 12, 13; 367/73

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

STN: USPATFULL, INSPEC, EUROPATFULL; IEL/IEEE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,886,702 A (MIGDAL et al) 23 March 1999, Summary of the Invention, Detailed Description.	1-28
A, P	US 6,018,497 A (GUNASEKERA) 25 January 2000, Summary of the Invention, Detailed Description of the Preferred Embodiment.	1-28
A, P	US 6,052,520 A (WATTS, III) 18 April 2000, Summary, Detailed Description of the Preferred Embodiments.	1-28
A, P	US 6,078,869 A (GUNASEKERA) 20 June 2000, Summary of the Invention, Detailed Description of the Preferred Embodiment.	1-28

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 06 SEPTEMBER 2000	Date of mailing of the international search report 02 OCT 2000
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer RUSSELL FREJD Telephone No. (703) 305-4839

Form PCT/ISA/210 (second sheet) (July 1998)*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/17101

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A, E	US 6,106,561 A (FARMER) 22 August 2000, Summary of the Invention, Description of the Preferred Embodiment.	1-28
A	HUANG et al. YUANTU. A Practical Fuzzy Interpolator for Prediction of Reservoir Permeability. Fuzzy Systems Conference Proceedings. FUZZ-IEEE '99. IEEE International. 1999. Vol. 3. pages 1528-1533.	1-28
A	WONG et al. P.M. An Improved Technique in Porosity Prediction: A Neural Network Approach. IEEE Transactions on Geoscience and Remote Sensing. Vol. 33. No. 4. July 1995. pages 971-980.	1-28
A	NIELSON. D.L. Rock Permeability in High-Temperature Geothermal Systems. Proceedings of the 32nd Intersociety Energy Conversion Engineering Conference, IECEC-97. 1997. Vol. 3. pages 1837-1839.	1-28
A	HUANG et al. Y. An Improved Fuzzy Neural Network for Permeability Estimation from Wireline Logs in a Petroleum Reservoir. TENCON '96. Proceedings. 1996 IEEE TENCON. Digital Signal Processing Applications. Vol. 2. pages 912-917.	1-28
A	SILVER et al. D. Tracking Scalar Features in Unstructured Data Sets. Visualization '98. Proceedings. 1998. pages 79-86.	1-28

NOTES TO FORM PCT/ISA/220 (continued)

The following examples illustrate the manner in which amendments must be explained in the accompanying letter:

1. [Where originally there were 48 claims and after amendment of some claims there are 51]:
"Claims 1 to 29, 31, 32, 34, 35, 37 to 48 replaced by amended claims bearing the same numbers; claims 30, 33 and 36 unchanged; new claims 49 to 51 added."
2. [Where originally there were 15 claims and after amendment of all claims there are 11]:
"Claims 1 to 15 replaced by amended claims 1 to 11."
3. [Where originally there were 14 claims and the amendments consist in cancelling some claims and in adding new claims]:
"Claims 1 to 6 and 14 unchanged; claims 7 to 13 cancelled; new claims 15, 16 and 17 added." or
"Claims 7 to 13 cancelled; new claims 15, 16 and 17 added; all other claims unchanged."
4. [Where various kinds of amendments are made]:
"Claims 1-10 unchanged; claims 11 to 13, 18 and 19 cancelled; claims 14, 15 and 16 replaced by amended claim 14; claim 17 subdivided into amended claims 15, 16 and 17; new claims 20 and 21 added."

"Statement under Article 19(1)" (Rule 46.4)

The amendments may be accompanied by a statement explaining the amendments and indicating any impact that such amendments might have on the description and the drawings (which cannot be amended under Article 19(1)).

The statement will be published with the international application and the amended claims.

The statement should be brief, it should not exceed 500 words if in English or if translated into English.

It should not be confounded with and does not replace the letter indicating the differences between the claims as filed and as amended. It must be filed on a separate sheet and must be identified as such by a heading, preferably by using the words "Statement under Article 19(1)."

It should not contain any disparaging comments on the international search report or the relevance of citations contained in that report. Reference to citations, relevant to a given claim, contained in the international search report may be made only in connection with an amendment of that claim.

In what language ?

The amendments must be made in the language in which the international application is published. The letter and any statement accompanying the amendments must be in the same language as the international application if that language is English or French; otherwise, it must be in English or French, at the choice of the applicant.

Consequence if a demand for international preliminary examination has already been filed ?

If, at the time of filing any amendments under Article 19, a demand for international preliminary examination has already been submitted, the applicant must preferably, at the same time of filing the amendments with the International Bureau, also file a copy of such amendments with the International Preliminary Examining Authority (see Rule 62.2(a), first sentence).

Consequence with regard to translation of the international application for entry into the national phase ?

The applicant's attention is drawn to the fact that, where upon entry into the national phase, a translation of the claims as amended under Article 19 may have to be furnished to the designated/elected Offices, instead of, or in addition to, the translation of the claims as filed.

For further details on the requirements of each designated/elected Office, see Volume II of the PCT Applicant's Guide.